CLAIMS

1. A clamping device in which at least one of a pair of clamping arms, i.e., at least a first clamping arm is driven and rotated to clamp a workpiece between the other clamping arm, i.e., a second clamping arm and the first clamping arm, the device comprising:

an arm rotary shaft rotatably supported on a clamp body and mounted with the first clamping arm;

a clamp arm driving mechanism including a worm wheel mounted to the arm rotary shaft, a worm engaged with the worm wheel, and a first driving source for driving the worm;

a junction frame supporting the worm and the first driving source and disposed to be able to turn around the arm rotary shaft independently of the arm rotary shaft;

a clamping force applying mechanism for applying a rotating force in a direction opposite to a reaction force in clamping to the junction frame to thereby generate a rotating force in a clamping direction in the arm rotary shaft through the worm and the worm wheel engaged with each other to thereby apply a clamping force to the first clamping arm; and

a sensor for outputting a signal when the sensor detects that the first clamping arm has come in contact with the workpiece to stop the first driving source and to cause the clamping force applying mechanism to operate.

2. A clamping device according to claim 1, wherein the clamping

force applying mechanism includes a clamp spring for generating a rotating force in the junction frame by action of a spring force and a second driving source for controlling the clamping spring and the clamping spring is displaced by the second driving source to a position where the spring force acts on the junction frame and to a position where the spring force does not act on the junction frame.

3. A clamping device according to claim 2, wherein the clamping force applying mechanism further includes a transmitting shaft for moving forward and backward with respect to the junction frame and the transmitting shaft is moved forward by the clamping spring to apply the spring force to the junction frame in clamping and is moved backward by the second driving source to displace the clamping spring to a non-actuated position in non-clamping.

4. A clamping device according to claim 3, wherein the clamping spring is formed of a plurality of stacked disc springs, the transmitting shaft passes through a center of the stack of disc springs, one end of the stack of disc springs is in contact with a spring seat on the clamp body, and the other end is in contact with a shaft head portion at a tip end of the transmitting shaft.

5. A clamping device according to claim 4, wherein a "flexure-spring force" characteristic curve of the disc spring has a region in which the spring force is substantially constant with respect to flexure variation and the spring force in the

region is applied to the junction frame.

6. A clamping device according to claim 3, wherein a second driving source includes a solenoid for generating an electromagnetic attracting force by energizing a coil and a plunger to be attracted to the solenoid and a base end portion of the transmitting shaft is connected to the plunger.

7. A clamping device according to claim 4, wherein a second driving source includes a solenoid for generating an electromagnetic attracting force by energizing a coil and a plunger to be attracted to the solenoid and a base end portion of the transmitting shaft is connected to the plunger.

8. A clamping device according to claim 5, wherein a second driving source includes a solenoid for generating an electromagnetic attracting force by energizing a coil and a plunger to be attracted to the solenoid and a base end portion of the transmitting shaft is connected to the plunger.

9. A clamping device according to claim 1, wherein the junction frame is elastically pushed by a return spring in a direction against a reaction force in clamping and the sensor is mounted in a position on the clamp body and facing the junction frame and detects that the junction frame has been displaced by action of the reaction force in clamping.

10. A clamping device according to claim 2, wherein the junction frame is elastically pushed by a return spring in a direction against a reaction force in clamping and the sensor is mounted in a position on the clamp body and facing the junction frame and detects that the junction frame has been displaced by action of the reaction force in clamping.

11. A clamping device according to claim 3, wherein the junction frame is elastically pushed by a return spring in a direction against a reaction force in clamping and the sensor is mounted in a position on the clamp body and facing the junction frame and detects that the junction frame has been displaced by action of the reaction force in clamping.

12. A clamping device according to claim 4, wherein the junction frame is elastically pushed by a return spring in a direction against a reaction force in clamping and the sensor is mounted in a position on the clamp body and facing the junction frame and detects that the junction frame has been displaced by action of the reaction force in clamping.